THE GAMGRAM

No. 74 THE FUTURE OF INTO-PLANE FILTRATION JUN. 2022

REVISED MAR. 2025

This has been a very difficult GamGram to write. It is a very complex subject and opinions vary. We have tried to be objective and fully informative. It is a bit repetitive in places, to be complete. The nature of this subject is complicated, so please read it carefully and completely. There are no simple answers.

We need to cover a little history to start.

Jet fuel filtration (into plane) in the last 50 years went from Filter Separators (made to API/EI-1581) to Monitors (Made to API/EI1583 - Note, API transferred these standards to EI many years ago).

Filter separators filter out dirt and separate water. They work very, very well. The water collects in the bottom of the filter vessel, the “sump,” and is drained away. They are (and have always been) the mainstay of the industry from the refinery to the airport. Every time fuel moves on its way to the airport, it passes through a filter separator. These workhorses have evolved over the past 60-70 years. In high dirt environments, pre-filters are used to remove dirt more cost effectively, but are followed by filter separators.

Monitors were discovered to provide final (into plane) filtration that was excellent and at a lower cost. They positively removed dirt and absorbed, not separated, all the free water. The industry was happy with monitors on into-plane filtration for a long time, but then it was found that some of the water-absorbing filter material (Super Absorbent Polymer - SAP) was getting to the aircraft engine fuel controls, a bad thing. So we were faced with the need to replace these SAP elements, and still get clean, dry fuel to the aircraft.

More on the available solutions later.

As we have established, filter separators have worked well for decades, with some occasional problems. Over the years, this technology has improved quite a bit. SAP elements were considered slightly better at stopping water, and they were smaller, lighter, and less expensive - plus, because they simply absorbed water, the vessels didn’t need a water float or probe to stop flow in the vehicle if water accumulated.

Today (and for some time), filter separator technology has been really very, very good. As an example, JFK and Newark International Airports operated with both into-plane filter separators followed by a monitor for decades - without a single filter separator passing water. Not once did they need to replace a SAP element.

The New York airports are considered a difficult location because much of the fuel comes in by multi-product (common carrier) pipeline. Slight mixes with other fuels are inevitable in such systems. This stresses filter separators but modern separators have been able to stand up to these challenges.

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The smaller size and lighter weight of vessels designed for SAP elements makes replacing them with modern filter separators often impossible. Not only because filter separators are much larger, but (full of fuel) **much** heavier.

So for into-plane filtration of aviation fuels, virtually everyone has used monitors for decades. As previously mentioned, the NY Port Authority chose to keep the filter separators and add monitor vessels downstream of them. As an industry, we have gained from their decision, because we now know that modern filter separators can be trusted to not pass dirt or water (assuming the fuel is basically good fuel).

SAP technology is being removed from the industry standards. You need to change your filtration. The time frame depends on where you are - ask your airline or oil company if in doubt.

WHAT IS THE NEXT STEP? OPTIONS WITHOUT CHANGING THE FILTER VESSEL

Ideally, the solution would be to use the same filter vessels as we used with SAP elements - because filter separators are much larger and heavier, and a solution that does not require replacing or modifying the vehicle was sought.

AFGUARD

The first approved technology is the Faudi electronic sensor, the “Afguard”. This is composed of a control box and a screw-in sensor that mounts to the fuel pipe. It is used with simple dirt-only filter elements in the “monitor” vessel. The elements meet EI-1599 and remove only the dirt - so they MUST have an electronic sensor to sense water. The sensor stops flow if water is sensed downstream of the filter vessel. The advantage was that no modification of the vessel was needed. The disadvantages are high initial cost with installation and the simple fact that if water is present, the sensor cannot remove the water. This approach meets the EI-1598 standard and is fully approved. Shell Oil uses it widely without any significant reported problems.

The advantage of the Afguard is that you only need to modify the pipe and install a control box, you do not need to replace or modify the vessel or refueling cart/truck. But there must be power, it will not work on an unpowered “towable” hydrant cart without power.

It is also an expensive system. Reports are that, installed, this can range from $20,000 to as much as $40,000 USD or more, plus downtime. Recalibration periodically (we believe every two years) is a long term cost.

There have been some reports of the Afguard sensors apparently indicating that water is present when it is not present (perhaps sensing turbulence, air, or vapor bubbles). The policy of the oil company, airline or refueler operator must address how to return to operation if water is indicated. You need to be sure water does not reach the aircraft. Flushing or recirculation can be part of this.

BARRIER ELEMENTS

Velcon has released a new element that fits directly into existing monitor vessels and which removes dirt and separates the water. These elements do not absorb water as SAP did, the elements have a media that repels or “blocks” the water, hence the name “barrier” elements. The advantage is that no modification of the vehicle is needed. The disadvantage is that it is a very fine filter. If there is a lot of very fine dirt in the fuel, filter element life may be a problem. In addition, the elements are more

expensive than the old SAP elements. Barrier elements have met the requirements of EI1588 and CSA B836-22 and are approved by A4A (the US, ATA-103 standard).

The advantages of barrier elements is that no modification to the refueling vehicle needs to be made, and no water goes into the aircraft.

OVERVIEW: WHAT IS YOUR BEST PATH?

The size of your operation makes a difference. There is a great deal of difference between large and small airports. A small airport may only pump a small volume of fuel a month and a large airport may pump millions of gallons or liters a day.

Barrier elements in existing monitor vessels may be your best choice, depending on how much fine dirt you have. Trying barrier elements is a simple thing, and worth considering.

There are also new smaller into-plane filter separators, with 2” coalescer elements, but they are still somewhat longer and heavier than monitor vessels of the same flow rate capacity. (Never forget the weight of the fuel inside!) This higher weight may be a problem in older vehicles/carts.

Due to the high initial cost, an electronic sensor may be ideal at a large airport and less financially advantageous at a small airport (as opposed to Barrier elements) due to the high cost of the Afguard and installation of the sensor and an electrical control box - even if there is fine dirt that plugs the elements. Different electrical codes may be an issue for explosion-proof electrical installation.

The costs need to be studied and compared. Also, if there is a problem with a water sensor, someone on your staff needs to be educated on how to troubleshoot the system and deal with alarms.

The cost of replacing barrier elements due to fine dirt can be greater than the Afguard approach.

But there is the other option, replacing the monitor vessel with a filter separator is definitely an option to consider in very low flow rate fixed cabinets or refueling systems, such as for very small aircraft. It is often not possible on refueler vehicles, due to the larger size and weight of filter separators. It may then make more sense to replace the vehicle, depending on the age and cost of maintenance.

It is an option to put a lower flow rate filter separator vessel onto a refueler. For example, a 300gpm refuelercan be down rated to 200gpm. A smaller filter separator may fit and the reduced flow rate may not be an inconvenience.

But do remember, a filter separator requires a water sensor. This can be a float or a probe, but this adds costs, including installation. But a filter separator does NOT need a high differential pressure (DP) sensor (such as a switch on the Gammon Gauge) but such a switch is necessary with barrier elements.

In this GamGram, we have attempted to be clear, informative and succinct - but not take sides or leave anything important out. There is no simple, ideal solution, at this time. Every path carries an added cost over the old SAP monitor elements.

In our opinion, we feel the long term solution on new refueler vehicles is to go back to filter separators. They tend to provide nearly uninterrupted operation, a great thing! For more information, please contact the filter manufacturers, your oil company, JIG, A4A, or the airline.